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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* MARK THOMAS McCORMACK,  
HUNT HANG JIANG, MICHAEL G. PETERS,  
and YASUHITO TAKAHASHI

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Appeal 2009-1244  
Application 09/866,092  
Technology Center 2800

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Decided:<sup>1</sup> March 25, 2009

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Before MAHSHID D. SAADAT, CARLA M. KRIVAK,  
and ELENI MANTIS MERCADER, *Administrative Patent Judges*.

KRIVAK, *Administrative Patent Judge*.

DECISION ON APPEAL

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<sup>1</sup> The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, begins to run from the decided date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

Appellants appeal under 35 U.S.C. § 134 from a final rejection of claims 17-24, 26-34, and 36-44. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

#### STATEMENT OF CASE

Appellants' claimed invention is a multi-layer printed circuit board having at least one prefabricated, integrated electronic component (Abstract). The electrical assembly is produced by an efficient and cost effective method for embedding electronic components within multi-layer substrates such as printed circuit boards (Spec. 2:17-19).

Independent claim 17, reproduced below, is representative of the subject matter on appeal.

17. A multi-layer printed circuit board having at least one prefabricated integrated electronic component embedded therein comprising:

a polymeric circuit board substrate having a first substrate surface, a second substrate surface, and a cavity formed in said first substrate surface;

a first integrated electronic component, where said first integrated electronic component is prefabricated prior to being securely attached in the cavity;

a first dielectric layer disposed on said first substrate surface and over said first integrated electronic component;

a metallic layer disposed on said first dielectric layer;

an electrically conductive first via passing through said first dielectric layer in contact with said metallic layer;

a second dielectric layer disposed over said first via and over said metallic layer; and

a second electrically conductive via extending at one location through said first and second dielectric layers and electrically coupled to said first integrated electronic component.

#### REFERENCES

Marcinkiewicz	US 5,241,456	Aug. 31, 1993
Miura	US 5,565,706	Oct. 15, 1996
Desai	US 5,739,188	Apr. 14, 1998
Wojnarowski	US 5,866,952	Feb. 2, 1999
Miyazawa	US 5,953,619	Sep. 14, 1999
Ma	US 6,154,366	Nov. 28, 2000
Higashi	US 6,861,284 B2	Mar. 1, 2005
		(filed Dec. 11, 2000)

The Examiner rejected claims 17, 33, 34, 38, and 39 under 35 U.S.C. § 103(a) based upon the teachings of Ma, Wojnarowski, and Higashi.

The Examiner rejected claims 18, 20-23, 27, 30, 36, 40, 41, and 43 under 35 U.S.C. § 103(a) based upon the teachings of Ma, Wojnarowski, Higashi, and Miura.

The Examiner rejected claim 19 under 35 U.S.C. § 103(a) based upon the teachings of Ma, Wojnarowski, Higashi, and Desai.

The Examiner rejected claims 24, 26, 28, 29, 31, 32, and 44 under 35 U.S.C. § 103(a) based upon the teachings of Ma, Wojnarowski, Higashi, Miura, and Marcinkiewicz.

The Examiner rejected claims 37 and 42 under 35 U.S.C. § 103(a) based upon the teachings of Ma, Wojnarowski, Higashi, Miura, and Miyazawa.

Appellants contend Ma does not teach or suggest a substrate having a cavity formed therein in which a prefabricated component is mounted (App. Br. 11; Reply Br. 2).

## ISSUES

Did Appellants establish the Examiner did not provide a prima facie case of obviousness with respect to the claims based on the Ma, Wojnarowski, Higashi, Miura, Desai, Miyazawa, and Marcinkiewicz references?

## FINDINGS OF FACT

1. Appellants' invention is a multi-layer printed circuit board having at least one prefabricated integrated electronic component embedded therein (cls. 17, 40, 44). The multi-layer printed circuit board includes a polymeric circuit board substrate having first and second substrate surfaces, and a cavity formed in the first substrate surface (cls. 1, 40, 44). The multilayer printed circuit board also includes a first integrated electronic component that is prefabricated prior to being securely attached in the cavity (cls. 17, 40, 44).

2. Ma shows a chip-on-flex package that includes a flex component 102 mounted to an active surface 104 of a microelectronic die 106 (col. 4, ll. 11-13). An encapsulation material 112 is formed to abut the backside of a moisture barrier layer 162 (col. 4, ll. 18-21). The encapsulating material 112 is a plastic, resin, or the like (col. 3, ll. 3-5).

## PRINCIPLES OF LAW

“The patentability of a product does not depend on its method of production. If the product in a product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 777 F.2d 695, 697 (Fed. Cir. 1985) (citations omitted). Further, “[R]egardless of how broadly or narrowly one construes a product-by-process claim, it is clear that such claims are always to a product, not a process.” *SmithKline Beecham Corp. v. Apotex Corp.*, 439 F.3d 1312, 1317 (Fed. Cir. 2006).

## ANALYSIS

### *Claims 17, 33, 34, 38, and 39*

The Examiner rejected claims 17, 33, 34, 38, and 39 under 35 U.S.C. § 103(a) based upon the teachings of Ma, Wojnarowski, and Higashi (Ans. 4). The Examiner finds that Ma does not disclose the circuit board being polymeric, but that Wojnarowski does. Further the Examiner finds that Ma and Wojnarowski do not disclose a second electrically conductive via extending at one location but that Higashi teaches wiring traversing multiple insulating layers (*id*). The Examiner cites Fig. 2j as showing the printed circuit board of Appellants claimed invention.

Appellants contend Ma does not disclose a substrate having a cavity formed in the substrate. Rather, Ma “merely shows an IC chip that is mounted on a flexible wiring interconnect” (a flex component) (App. Br. 11). Appellants further contend the Examiner’s argument that “‘a cavity formed in said first substrate surface’ is a product-by-process limitation” is

without merit (App. Br. 11). Appellants state there is no cavity disclosed in Ma. “On the contrary, in *Ma*, a component is surrounded, after having already been connected to flex component, with an encapsulating material” (App. Br. 11).

Appellants have not considered that “if the product in a product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” *See Thorpe, supra*. Although Ma teaches attaching a microelectronic die to a flex component and then encapsulating it with a plastic or resin material (FF 2), the resulting final product shown in Fig. 2j is identical to Appellants’ claimed invention in that the microelectronic device (die 106) becomes formed in a cavity that is created by the encapsulation material 112. Further, Appellants recognize that their claimed circuit board is formed by a different “technique” (App. Br. 11). Appellants assert that Ma’s “technique is much different than securing a prefabricated component in a cavity that has been formed in a substrate” (App. Br. 11). However, a technique (i.e., a process) that does not affect the final product cannot necessarily make the product patentable (*see In re Thorpe, supra*). There is nothing in the claims that distinguishes Appellants’ final product from Ma’s final product. The Examiner’s statement that “the appellant’s claims are directed towards product, and the method or technique used are not patentable beyond what the final structure the method or technique entails which, in this case, is a substrate having a cavity formed in a first substrate surface” (Ans. 9), is reasonable.

Appellants have also not shown any error in the Examiner’s citation of Wojnarowski. The Examiner merely used this reference to show that a

circuit board substrate can be polymeric. Ma states that the encapsulation layer is resin/plastic (col. 3, ll. 3-5) and Wojnarowski clearly discloses that these substrate molding materials are indeed polymeric (Ans. 10).

With respect to Higashi, Appellants' provided no arguments with respect to this reference.

Accordingly, Ma substantially teaches or suggests all the features of Appellants' claimed product, and Wojnarowski and Higashi further confirm the Examiner's findings. Thus, the 35 U.S.C. § 103(a) rejection of claim 17, and claims 33, 34, 38, and 39, which were argued together, over the collective teachings of these references is sustained.

*Claims 18, 20-23, 27, 30, 36, 40, 41, and 43*

The Examiner rejected claims 18, 20-23, 27, 30, 36, 40, 41, and 43 under 35 U.S.C. § 103(a) based upon the teachings of Ma, Wojnarowski, Higashi, and Miura. The Examiner finds that Miura discloses a multi-layer package board having external output terminals that coincide with Appellants' first and second metallic layers (Ans. 6). Appellants argue claims 18, 20-23, 27, 30, and 36 separately from claims 40, 41, and 43 (App. Br. 14). This rejection is addressed with respect to claims 18 and 40.

With respect to claim 18, Appellants assert that claims 18, 20-23, 27, 30, and 36 depend from claim 17 and therefore are allowable (App. Br. 14). Appellants further assert that, with respect to claim 18, there is no teaching or suggestion in Miura to provide external connections to Ma, and in fact, it would be against the teachings of Ma because of the encapsulation material 112 (App. Br. 14-15).

The Examiner's finding that it would be beneficial to modify Ma with the teachings of Miura, which shows that a die can have additional



connections on a polymeric substrate, in view of Wojnarowski and Higashi, (Ans. 11-12), is reasonable. Additionally, the wiring patterns 22a-22c in Higashi show that this feature was known in the art at the time of the invention.

In view of the above analysis, Appellants arguments are found to be unpersuasive as they have not shown the Examiner erred in combining the references. Thus, the 35 U.S.C. § 103(a) rejection of claims 18, 20-23, 27, 30, and 36 over the collective teachings of Ma, Wojnarowski, Higashi and Miura is sustained.

With respect to claims 40, 41, and 43, Appellants merely rely on the same arguments presented above, which were found to be unpersuasive. Because the limitations in claim 40 are similar to those in claim 17 (App. Br. 14), the 35 U.S.C. § 103(a) rejection of claims 40, 41, and 43 over the collective teachings of Ma, Wojnarowski, Higashi and Miura is sustained.

*Claim 19*

The Examiner rejected claim 19 under 35 U.S.C. § 103(a) based upon the teachings of Ma, Wojnarowski, Higashi and Desai. The Examiner finds that Desai teaches at least two polymeric layers (Ans. 7).

Appellants argue that Desai is in a “wholly different art than the references with which it has been combined” and there is no indication that the problems addressed by Desai are related to those in the other cited references (App. Br. 15). Appellants also assert that there is no motivation to combine the references as found by the Examiner (App. Br. 15).

The Examiner correctly finds that Desai is within the field of Appellants’ endeavor. Further, as Desai teaches a multilayered product that includes a core or substrate layer and a cap or cover layer for the core layer

(col. 3, ll. 26-30), as shown in Figures 1 and 10 of Appellants' disclosure, it would have been obvious to combine these references in the manner suggested by the Examiner. Thus, for the reason set forth above, the 35 U.S.C. § 103(a) rejection of claim 19 over the collective teachings of Ma, Wojnarowski, Higashi and Desai is sustained.

*Claims 24, 26, 28, 29, 31, 32, and 44*

The Examiner rejected claims 24, 26, 28, 29, 31, 32, and 44 under 35 U.S.C. § 103(a) based upon the teachings of Ma, Wojnarowski, Higashi, Miura, and Marcinkiewicz.

Appellants contend that because claims 24, 26, 28, 29, 31, and 32, depend from claim 17, and claim 44 includes substantially the same limitations of claim 17, these claims are allowable for the reasons set forth above (App. 16).

Because the arguments presented above with respect to claim 17 were found to be unpersuasive, these arguments are also found to be unpersuasive with respect to claims 24, 26, 28, 29, 31, 32, and 44. Thus, the 35 U.S.C. § 103(a) rejection of these claims over the collective teachings of Ma, Wojnarowski, Higashi, Miura, and Marcinkiewicz is sustained.

*Claims 37 and 42*

The Examiner rejected claims 37 and 42 under 35 U.S.C. § 103(a) based upon the teachings of Ma, Wojnarowski, Higashi, Miura, and Miyazawa.

Appellants contend that because these claims depend from claims 17 and 40, respectively, they are allowable for the reasons set forth above.

Because the arguments presented above with respect to claims 17 and 40 were found to be unpersuasive, these arguments are also found to be unpersuasive with respect to claims 37 and 42. Thus, the 35 U.S.C. § 103(a) rejection of these claims over the collective teachings of Ma, Wojnarowski, Higashi, Miura, and Miyazawa is sustained.

### CONCLUSION

The Examiner provided a prima facie case of obviousness and thus, did not err in rejecting claims 17-24, 26-34, and 36-44 under 35 U.S.C. § 103(a).

### DECISION

The Examiner's decision rejecting claims 17-24, 26-34, and 36-44 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

### AFFIRMED

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